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Studies were performed on the precession of spin polarized electrons in a magnetic field of up to 12T. Even at densities high enough to provide gain and to see lasing, sufficient spin polarization remains for the lasing emission to alternate back and forth between right and left circular polarization as the spins precess. Thus, the vertical-cavity surface-emitting laser emission is locked to the spin precession clock, one example of coherent control.

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DEVELOPING RARE-EARTH-DOPED SEMICONDUCTOR LIGHT SOURCES
(AASERT-95)/(AFSOR)

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FINAL PROGRESS REPORT

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July 15, 1998

Air Force Office of Scientific Research

AASERT/AFOSR Final Report

The parent grant was terminated after 71% of the funding was received, purportedly for financial rather than scientific reasons. With an extension to stretch the remaining funds, the parent grant ended March 31, 1997. This AASERT end date was May 31, 1998. However, I was requested by AFOSR to expend those funds more quickly if at all possible. This was done by supporting two students in the summer and early fall of 1997.

John Prineas submitted a detailed report last year of his research on luminescence of Er-doped quantum wells, the subject of the parent grant. That research has been published in the *Journal of Applied Physics*. John then concentrated on the radiative coupling effects between a large number of quantum wells. He also measured the linewidths of normal-mode-coupling microcavities as a function of the number of intracavity quantum wells and mirror reflectivity. He showed that the measured quantum well absorption, plus Kramers-Kronig to obtain the refractive index as a function of energy, put into a transfer matrix calculation reproduces very well the measured reflectivity R, transmission T, and absorption A = 1 – R - T. This agreement between measurements and linear dispersion theory, disproving claims to the contrary in two *Physical Review Letters*, has itself been published in said journal. Then John was switched to an AFOSR/AASERT awarded to Professor Galina Khitrova to continue these studies.

Jill Berger worked on the precession of spin polarized electrons in a magnetic field of up to 12T. Even at densities high enough to provide gain and to see lasing, sufficient spin polarization remains for the lasing emission to alternate back and forth between right and left circular polarization as the spins precess. Thus, the vertical-cavity surface-emitting laser emission is locked to the spin precession clock, one example of coherent control. Jill finished her Ph.D. and took a job in California.

This AASERT clearly augmented our research program in a significant way, for which we are indeed grateful.

Hyatt M. Gibbs, Professor